Cell PRESS
Cell Stem Cell
Profile

Elaine Fuchs: ISSCR's President-Elect

By rights, Elaine Fuchs should be inside a taxi heading home from New York City's John F. Kennedy airport. Instead, the professor of mammalian cell biology and development at The Rockefeller University of New York City, a Howard Hughes Medical Institute investigator and president-elect of the ISSCR, is in Stockholm, Sweden, stranded alongside tens of thousands of other travelers because of the eruption of Eyjafjallajökull volcano. The ash cloud will force her to miss a stateside meeting this week and deliver her address over the telephone instead. Yet Fuchs still manages to sound both cheery and relaxed. She's had to overcome far greater hurdles to become a leader in the study of skin, stem cells, and their molecular and genetic connections to cancers and other diseases.

Fuchs grew up in a family of scientists that included her father and aunt, and now herself and her sister. After earning a bachelor's degree in physical chemistry and a doctorate in biochemistry, Fuchs joined Howard Green's cell biology lab at the Massachusetts Institute of Technology to gain exposure to biomedical research. Green had developed a means to maintain skin in culture. The experience of working with such an easily accessible tissue, rich in the cells that can grow into hair or heal wounds, sparked a fascination with skin that endures to this day.

Since then, Fuchs has played an important part in elevating the study of skin stem cells into a model system on par with the study of hematopoietic and neural stem cells. She began by cloning a number of genes for keratin proteins, which help give mammalian epidermis structure, and expressed them in transgenic mice to elucidate their function. She went on to show that genetic defects in keratins are responsible for two types of blistering skin disorders.

Curiosity about how skin stem cells form mature hair follicles, sebaceous glands, and the epidermis itself launched her into the stem cell arena. The move is characteristic of what guides her research. "You ask the interesting questions and you become fearless about tackling those problems. It's not doing the science we're comfortable with, but the science we're excited by," Fuchs says.

This ethos has led Fuchs into exciting territory. She has identified two distinct populations of stem cells within hair follicles, tagging them with fluorescent markers while they were still in situ, and has worked out the molecular signaling environments that help extend "stemness" or start stem cells on the road to proliferation and differentiation. "I am particularly interested in the point of no return—when a stem cell leaves its niche to become a rapidly proliferating cell, and at what point the process can still be reversed," Fuchs says.

Fuchs's achievements have been recognized with a long list of prestigious prizes and awards; just this past October, she received the National Medal of Science from President Barack Obama at the White House. As an ardent supporter of Obama's campaign, she says, "I couldn't have been more pleased with regards to the president who happened to be in office at the time. It's such an honor to be recognized by your colleagues and your nation in that way." The president discussed the importance of funding basic research, supporting science education, and maintaining an international science community. "It was thrilling to be able to listen to my own president espouse those ideas," Fuchs says.

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To keep her life balanced, she begins most days with a vigorous swim. "When we were living in Chicago, my husband and I had a ritual. At 6 a.m. in the summers we would go to Lake Michigan and take one lap, timed so as on our trip back, every lift of the arm we saw the sun going higher and higher," Fuchs says. "It wakes me up, clears my mind, and helps me feel as if an important part of my existence is maintained." It's a pleasure from her home state that she misses, although for a lover of good food and wine, the dining options of New York offer some recompense.

Though unwilling to go for dips in the East River, Fuchs snorkels on vacation every chance she gets. She and her husband have taken six different trips to Indonesia alone, drawn there by the island nation's rich array of marine life. "Some of the best snorkeling I've done is in the South Pacific with manta rays and a few sharks here and there," Fuchs says. On these trips, she and her husband indulge an adventurous streak. "Lonely Planet used to be my bible, when I had time to plan the entire trip myself," she says.

Even now, they prefer to wander off the beaten path. Recently, they spent part of a trip to China in an ethnic minority enclave living with a local family. "It's good to be placed in a realm where you begin to appreciate that the skills your mother has are the ones appreciated by most of the world—to be able to cook and plant vegetables in the garden and know when the fruit is ripe," Fuchs says. "It's also very humbling to realize that while we love the science that we do, and are fascinated by the questions we ask, these are not the normal questions that the average person on the planet is thinking about."

Back at work, Fuchs watches over her lab as her family. She has a reputation as a rigorous taskmaster who maintains the highest scientific standards, who at the same time is an extraordinarily

supportive mentor. Lab fellows routinely get the opportunity to challenge the prevailing views of the lab and its leader. Fuchs encourages their individuality and independence, and challenges them back in turn as part of their training. The approach stimulates good science; an impressive percentage of lab members go on to coveted positions in academia and research.

Fuchs herself entered academia at a time when the few female scientists suffered a tremendous amount of discrimination. She watched as the University of Michigan turned down her older sister for graduate study because women were deemed too much of a risk to start a family and not finish. And several years after receiving tenure at the University of Chicago, Fuchs herself discovered that she was paid less than new assistant professor hires; her paychecks increased only after she threatened to leave.

Such struggles with bias still inform her decisions. ''It has made me more cognizant of the importance of being a successful senior woman scientist. I feel that I'm in a better position to fight battles and make sure the avenue is paved for those coming up through the ranks below,'' Fuchs says. ''There certainly have been improvements over the years, but there is still work to be done in the United States and globally. We are an international society, and we must make sure that we function scientifically, ethically, and morally as a world of scientists from all countries, inclusive of all genders and ethnic backgrounds'' she says.

As ISSCR president, Fuchs hopes to encourage and involve a younger, more international cohort of scientists in the Society. For example, she plans to make more avenues of professional recognition available to younger scientists. ''Awards, recognition and the opportunity to speak for students, postdocs, and young investigators can really make a difference and develop an allegiance to the Society at an early stage in their career,'' she says. ''I would like to expand these avenues and increase the visibility and participation of our younger scientists in the stem cell field.''

At the same time, Fuchs plans to intensify Society efforts to provide educational tools for high schools, colleges, and the public about stem cell research. ''We need to make sure we convey to others why we are so excited by stem cell research, what its potential is for regenerative medicine and human disease, and also what the potential pitfalls are, so that people get a realistic but informed view,'' Fuchs says. As president of the American Society for Cell Biology, she began inviting high school and college instructors to society meetings. She plans to facilitate similar educator-research interactions in stem cell science, and to encourage more members to participate in outreach efforts, because she is convinced that average citizens want to know more. ''Whether on an airplane or in a taxi, the nonscientists I encounter day to day are definitely interested in stem cell research. I've encountered very few who have an immediate negative reaction; more often people are very curious, and quick to express their positive interest in stem cell research.''

Fuchs is heartened by the increasing importance of ISSCR meetings for shaping research ideas and moving stem cell science forward. It's a collegiality Fuchs has enjoyed as she swaps emails with fellow scientists marooned by Icelandic ash. ''Scientists around the world aren't burdened by the kinds of major political barriers that hinder our nations' leaders. We're an international community who speak, interact with, and appreciate each other.''

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